Pathways of Change Explaining the Effect of Smoke-Free Legislation on Smoking Cessation in the Netherlands. An Application of the International Tobacco Control Conceptual Model

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Original Investigation

Pathways of Change Explaining the Effect of Smoke-Free Legislation on Smoking Cessation in the Netherlands. An Application of the International Tobacco Control Conceptual Model

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Abstract

Introduction: This study aims to test the pathways of change from individual exposure to smoke-free legislation on smoking cessation, as hypothesized in the International Tobacco Control (ITC) Conceptual Model.

Methods: A nationally representative sample of Dutch smokers aged 15 years and older was surveyed during 4 consecutive annual surveys. Of the 1,820 baseline smokers, 1,012 participated in the fourth survey. Structural Equation Modeling was employed to test a model of the effects of individual exposure to smoke-free legislation through policy-specific variables (support for smoke-free legislation and awareness of the harm of [secondhand] smoking) and psychosocial mediators (attitudes, subjective norm, self-efficacy, and intention to quit) on quit attempts and quit success.

Results: The effect of individual exposure to smoke-free legislation on smoking cessation was mediated by 1 pathway via support for smoke-free legislation, attitudes about quitting, and intention to quit smoking. Exposure to smoke-free legislation also influenced awareness of the harm of (secondhand) smoking, which in turn influenced the subjective norm about quitting. However, only attitudes about quitting were significantly associated with intention to quit smoking, whereas subjective norm and self-efficacy for quitting were not. Intention to quit predicted quit attempts and quit success, and self-efficacy for quitting predicted quit success.

Conclusions: Our findings support the ITC Conceptual Model, which hypothesized that policies influence smoking cessation through policy-specific variables and psychosocial mediators. Smoke-free legislation may increase smoking cessation, provided that it succeeds in influencing support for the legislation.

Introduction

Tobacco smoke pollution (TSP or secondhand smoke) can cause death, disease, and disabilities in nonsmokers (World Health Organization, 2003). TSP accounts for about 600,000 deaths a year among nonsmokers (Öberg, Jaakkola, Woodward, Peruga, & Prüss-Ustün, 2011). To protect nonsmokers from this risk, many countries have implemented smoke-free legislation that bans smoking in indoor workplaces and public places. A review on smoke-free legislation reported that some studies found a positive effect on smoking cessation, whereas other studies did not find this effect (Callinan, Clarke, Doherty, & Kelleher,

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2010). A recent study using data from 21 jurisdictions (countries, states, and provinces) that implemented smoke-free legislation in public places found evidence of a decrease in smoking prevalence in eight jurisdictions but no change in the other 13 (Bajoga, Lewis, McNeill, & Szatkowski, 2011). Knowledge about the pathways of change explaining the effect of smoke-free legislation on smoking cessation may help in understanding why smoke-free legislation increases smoking cessation in some circumstances and not in others.

The International Tobacco Control (ITC) Conceptual Model is a model that explicitly describes the pathways of change from tobacco control policies to smoking cessation (Fong, Cummings, et al., 2006). According to the ITC Conceptual Model, tobacco control policies influence individuals by first influencing factors that are most proximal (conceptually closest) or most specifically related to the policy itself. These factors are called policy-specific variables and include variables like warning label salience, perceived costs of cigarettes, and support for smoke-free legislation. Policy-specific variables in turn influence psychosocial mediators. Psychosocial mediators in the ITC Conceptual Model have been taken from various social cognitive models. These models assume that behavior is the result of intentions, and intentions, in turn, are the result of three main types of factors: attitudes, subjective norms, and self-efficacy (e.g., Ajzen, 1991; De Vries & Mudde, 1998). Finally, changes in psychosocial mediators are expected to influence policy-relevant outcomes, such as quit attempts and quit success.

To date, no published studies have reported on a test of the full causal chain explaining the effect of individual exposure to smoke-free legislation on smoking cessation (see Figure 1). Most studies have focused on the effects of implementing smoke-free legislation on support for smoke-free legislation and awareness of the harm of (secondhand) smoking (policy-specific variables). These studies mainly found that exposure to smoke-free legislation increases support for smoke-free legislation without examining how such support translates into changes in smoking behavior (Borland et al, 2006; Brown, Moodie, & Hastings, 2009; Fong, Hyland, et al., 2006; Hyland, Higbee, et al., 2009; Mons et al., 2012; Thrasher, Boado, Sebrié, & Bianco, 2009; Thrasher, Pérez-Hernández, Swayampakala, Arillo-Santillán, & Bottai, 2010; Thrasher, Swayampakala, et al., 2010). Some studies have also found associations of exposure to smoke-free legislation with awareness of the harm of smoking and secondhand smoking (Hyland, Higbee, et al., 2009; Thrasher, Pérez-Hernández, et al., 2010), while other studies have shown that support for smoke-free legislation is associated with awareness of the harm of secondhand smoking (Borland et al., 2006; Mons et al., 2012). Some studies have examined the effects of support for smoke-free legislation on attitudes, subjective norms, and self-efficacy (psychosocial mediators). It was found that support for smoke-free legislation was associated with attitudes (Macy, Middlestadt, Seo, Kolbe, & Jay, 2012; Nagelhout, Mons, et al., 2011; Thrasher, Besley, & González, 2010) and subjective norms (Brown et al., 2009; Macy et al., 2012; Nagelhout, Mons, et al., 2011; Thrasher et al., 2009) about smoking and quitting. These in turn increased intentions to quit smoking (Brown et al., 2009; Macy et al., 2012), but effects on smoking cessation were not studied.

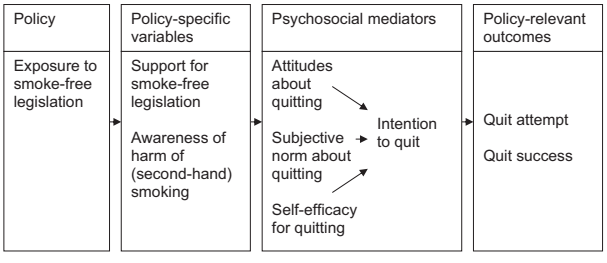

Figure 1. Hypothesized model of the pathways of change between exposure to smoke-free legislation and smoking cessation; adapted from the International Tobacco Control Conceptual Model (Fong, Cummings, et al., 2006).

For the current study, a nationally representative sample of smokers participating in the ITC Netherlands Survey was surveyed at four consecutive years before and after the implementation of smoke-free hospitality industry legislation in July 2008. Although the implementation of smoke-free legislation went relatively well in restaurants, there were considerable problems with the implementation in bars (Mons et al., 2012; Nagelhout, Mons, et al., 2011). High levels of noncompliance and low levels of societal and political support eventually led to a partial reversal of the smoke-free legislation in small owner-run bars at the end of 2010. Possibly due to the problems with bars, the smoke-free hospitality industry legislation had only a small impact on smoking cessation, without significantly reducing smoking prevalence (Nagelhout, Willemsen, & De Vries, 2011).

The aim of the current study was to apply the ITC Conceptual Model on pathways of change explaining the effect of individual exposure to smoke-free legislation on smoking cessation. Based on the ITC Conceptual Model and previous literature, we hypothesize that smoke-free legislation influences smoking cessation by first increasing support and harm awareness (policy-specific variables) and in turn increasing attitudes, subjective norms, and self-efficacy for quitting (psychosocial mediators).

Methods

Design

We used longitudinal data from four consecutive annual surveys of the ITC Netherlands Survey. The baseline survey was performed about 2 months before the implementation of the smoke-free legislation in 2008. The follow-up surveys were performed after the implementation, respectively 1, 2, and 3 years later in 2009, 2010, and 2011. Policy-specific variables, psychosocial mediators, and smoking cessation were modeled at consecutive survey waves, while controlling for policy-specific variables and psychosocial mediators at baseline, to allow for more confident inferences about the causality of the tested pathways of change.

Sample

Dutch smokers aged 15 years and older were recruited from TNS NIPObase, a large probability-based web database (Nagelhout et al., 2010). Quotas on gender, geographic region, household size, and education were determined from the Dutch Continuous Survey of Smoking Habits to get a sample that was representative of Dutch smokers. Potential respondents were identified as smokers (having smoked at least 100 cigarettes in their lifetime and currently smoking at least once per month) by means of a short screening survey in March 2008. In April 2008, 2,331

smokers were invited to participate in a web survey. Of these, 1,820 participated in the 2008 survey (78.1%). In April and May 2009, all 1,820 baseline smokers were invited to participate in the 2009 survey, and 1,447 took part (79.5%). In May 2010, all baseline respondents were invited, and 1,275 respondents participated in the 2010 survey (70.1%). In May and June 2011, all baseline respondents were invited, and 1,012 respondents participated in the 2011 survey (55.6%). The respondents received compensation for their participation in each survey by earning points for every answered question, as is standard procedure in the TNS NIPObase web panel. The points could be exchanged for money, which ranged between 5 and 7 Euros for each survey.

Measurements

Control Variables (2008)

Control variables were gender, age group, educational level, heaviness of smoking, smoking status, and attempts to quit smoking in the last year. These variables were assessed at the 2008 survey. Age was categorized as 15–24, 25–39, 40–54, and 55 years and older. Education was categorized in three levels: low (primary education and lower prevocational secondary education), moderate (middle prevocational secondary education and secondary vocational education), and high (senior general secondary education, pre-university education, and higher professional education). The Heaviness of Smoking Index (HSI) was created as the sum of two categorized measures: number of cigarettes per day and time before smoking the first cigarette of the day (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). HSI values ranged from 0 to 6 and were positively associated with nicotine dependence. Smoking status was categorized as daily smoker versus occasional smoker. Attempts to quit smoking were categorized as attempted to quit in the last year versus did not attempt to quit in the last year.

Individual Exposure (2009)

Not all individuals were exposed to the smoke-free legislation, because not all hospitality industry venues complied with the legislation and not all individuals visited hospitality industry venues. Individual exposure to smoke-free legislation was assessed using the questions "Which of the following best describes the rules about smoking in bars where you live?" and "Which of the following best describes the rules about smoking in restaurants where you live?" Response categories were "No rules or restriction" (0), "Smoking is allowed only in some indoor areas" (1), and "Smoking is not allowed in any indoor area" (2). Respondents who had not visited bars or restaurants or did not know the rules about smoking were placed in the category "no rules or restrictions". The two questions were also used in previous research to assess exposure to smoking restrictions (Hammond, Fong, Zanna, Thrasher, & Borland, 2006).

Policy-Specific Variables (2008, 2009)

Consistent with previous research (Nagelhout, Van den Putte, et al., 2012), support for smoke-free legislation was assessed using the questions "Do you support or oppose a complete Dutch smoking ban in bars?" and "Do you support or oppose a complete Dutch smoking ban in restaurants?" Response categories were "Strongly oppose" (1), "Oppose" (2), "Support" (3), and "Strongly support" (4). Cronbach's Alpha was 0.72.

Awareness of the harm of (secondhand) smoking was measured with two questions "In the last month, how often, if at all, did you think about the harm your smoking might be doing to you?" and "In the last month, how often, if at all, did you think about the harm your smoking might be doing to other people?" (Nagelhout, Van den Putte, et al., 2012). Response categories were "Never" (1), "Rarely" (2), "Sometimes" (3), "Often" (4), and "Very often" (5). Cronbach's Alpha was 0.67.

Psychosocial Mediators (2008, 2010)

Attitudes about quitting were assessed using the question "If you quit smoking within the next 6 months, this would be. . ." Respondents could answer on three 5-point scales, whether they thought this would be wise or unwise, pleasant or unpleasant, and positive or negative (Van den Putte, Yzer, Brunsting, & Willemsen, 2005). Cronbach's Alpha was 0.87.

Subjective norm about quitting was measured with the question "How do you think that most of the people who are important to you would feel about your quitting smoking within the next 6 months?" (Van den Putte, Yzer, & Brunsting, 2005). Response categories were "Strongly disapprove" (1), "Disapprove" (2), "Neutral" (3), "Approve" (4), "Strongly approve" (5).

Self-efficacy for quitting was measured using the questions "Suppose you want to quit smoking within the next 6 months, will you be able to resist smoking when: . . . you just woke up?", ". . . you have experienced something annoying?", ". . . you are having a cup of coffee or tea?", ". . . you are drinking alcohol?", ". . . you are offered a cigarette?" (Hoving, Mudde, & de Vries, 2006). Response categories were "I will certainly not be able" (1), "I will probably not be able" (2), "May be I will be able, may be not" (3), "I will probably be able" (4), and "I will certainly be able" (5). Cronbach's Alpha was 0.88.

Intention to quit was assessed with a single question: "Are you planning to quit smoking: within the next month?" (4), ". . . within the next 6 months?" (3), " . . . sometime in the future, beyond 6 months" (2), ". . . or are you not planning to quit?" (1) (De Vries, Mudde, Dijkstra, & Willemsen, 1998).

Policy-Relevant Outcomes (2011)

Whether respondents had attempted to quit smoking was measured with the question: "Have you made any attempts to stop smoking since the last survey?" (Hyland et al., 2006).

Quit success was assessed by asking respondents who had attempted to quit whether they were back to smoking or still stopped. Respondents who where still stopped or who were back to smoking, but reporting smoking less than once a month, were defined as successful quitters. Respondents who did not attempt to quit, or who were back to smoking more than once a month, were defined as smokers (Hyland et al., 2006).

Ethics

The ITC Netherlands surveys received ethics clearance from the Research Ethics Board of the University of Waterloo and the Central Committee on Research Involving Human Subjects in the Netherlands.

Analyses

Attrition analyses, sample characteristics, and correlation analyses were performed with SPSS version 17.0. For the correlation analyses, all variables were treated as continuous variables.

Structural Equation Modeling was performed using Mplus version 5.21 (Muthén & Muthén, 2007), while employing weighted least square parameter estimates. Model fit was assessed using the Comparative Fit Index (CFI), the Tucker-Lewis-Index (TLI), and the Root-Mean-Square Error of Approximation (RMSEA). For a satisfactory model fit, the CFI and TLI should be above 0.90, and the RMSEA should be under 0.05 (Hox & Bechger, 1998). All respondents who participated in the 2008 and 2011 survey (n = 1,012) were included in the analyses. Respondents who had quit smoking successfully before the 2011 survey were not asked the questions about psychosocial mediators at the 2010 survey and smoking cessation at the 2011 survey. These respondents could be included in the model because Mplus can use all available information from all observed (including incomplete) cases. All analyses were weighted by age and gender to be representative of the smoker population in the Netherlands.

We tested a model of the effects of individual exposure to smoke-free legislation in 2009 on quit attempts and quit success in 2011 through policy-specific variables in 2009 and psychosocial mediators in 2010. We controlled for the above mentioned control variables in 2008 and the policy-specific variables and psychosocial mediators, all as measured in 2008. Exposure to smoke-free legislation, support for smoke-free legislation, harm awareness, attitudes about quitting, and self-efficacy for quitting were entered as latent constructs and measured by the indicators as defined in the measurements section. Subjective norm about quitting, intention to quit, quit attempt, quit success, and the control variables were measured with single items and were thus observed variables. Support for smoke-free legislation, intention to quit, quit attempt, and quit success were treated as categorical variables, because they had nonnormal distributions. All other variables had approximately normal distributions and were treated as continuous variables.

Within the above described model, we tested the significance of the indirect paths of exposure to smoke-free legislation via all policy-specific variables and psychosocial mediators to quit attempts and quit success. In a separate model, we added direct paths from exposure to smoke-free legislation on quit attempts and quit success to test for full mediation.

Results

Attrition Analyses

Of the 1,820 baseline respondents, 1,012 (55.6%) participated in the 2011 survey. Respondents who participated in the 2011 survey were significantly older (mean age = 39.3, SD = 15.3) than respondents who did not participate in the 2011 survey (mean age = 33.9, SD = 15.2; $t = -7.5$, $p < .001$). Furthermore, respondents who participated in the 2011 survey were significantly more likely to be male ($\chi^2 = 8.8$, $p = .003$), lower educated ($\chi^2 = 9.1$, $p = .011$), and more likely to be a heavier smoker ($t = -2.4$, $p = .017$) than respondents who did not participate in the 2011 survey. Respondents who participated in the 2011 survey and who did not participate in the 2011 survey did not differ on support for smoke-free legislation, harm awareness, attitudes about quitting, subjective norm about quitting, and intention to quit smoking in 2008. Respondents who participated in the 2011 survey did have slightly less self-efficacy for quitting ($t = 2.3$, $p = .023$).

Sample Characteristics

Sample characteristics are shown in Table 1. Most respondents were daily smoker at baseline. About 23% of respondents reported at the 2008 survey to have attempted to quit smoking in the previous year. Respondents were mostly not supportive of smoke-free legislation and not much aware of the harm of (secondhand) smoking. Most respondents intended to quit smoking sometime in the future. More than one-third of respondents reported at the 2011 survey to have attempted to quit smoking in the previous year, and almost one fifth quit smoking successfully.

Correlations

Table 2 shows correlations between individual exposure, policy-specific variables, psychosocial mediators, and policy-relevant outcomes. Individual exposure to smoke-free legislation was weakly correlated with support for smoke-free legislation. Support for smoke-free legislation and harm awareness had a positive correlation. Both support and harm awareness correlated stronger with attitudes about quitting than with the subjective norm about quitting and self-efficacy. Attitudes about quitting correlated strongest with subjective norm about quitting and intention to quit. Attempting to quit correlated most with intention to quit. Quit success correlated most with self-efficacy for quitting and quit attempts.

Structural Equation Model

The results of the Structural Equation Model are displayed in Figure 2. The model fitted the data reasonably well (CFI = 0.899, TLI = 0.933, RMSEA = 0.037) and explained 27.7% of the variance in quit attempts and 49.6% of the variance in quit success. All factor loadings in the final model were significant, with values between 0.51 and 0.91.

As can be seen in Figure 2, exposure to smoke-free legislation was associated with more support for smoke-free legislation ($\beta = 0.32$, $p = .007$) and more harm awareness ($\beta = 0.13$, $p = .034$). More support for smoke-free legislation predicted positive attitudes about quitting ($\beta = 0.26$, $p = .004$), while more harm awareness predicted a stronger subjective norm about quitting ($\beta = 0.13$, $p = .023$). Positive attitudes about quitting were associated with more intention to quit smoking ($\beta = 0.30$, $p < .001$), while subjective norm about quitting ($\beta = .03$, $p = .572$) and self-efficacy for quitting ($\beta = 0.05$, $p = .347$) were not significantly associated with intention to quit after controlling for the other predictors in the model. Intention to quit predicted quit attempts ($\beta = 0.46$, $p < .001$) and quit success ($\beta = 0.23$, $p = .023$), and self-efficacy for quitting predicted quit success ($\beta = 0.62$, $p < .001$).

Tests of Indirect and Direct Paths

Within the model in Figure 2, we tested the significance of the indirect paths of exposure to smoke-free legislation via all policy-specific variables and psychosocial mediators to quit attempts and quit success. There was a borderline significant indirect path from exposure to smoke-free legislation on quit attempts via support, attitudes, and intention ($\beta = 0.01$, $p = .059$).

In a separate model (not shown), we tested for full mediation by adding direct paths from exposure to smoke-free legislation on quit attempts and quit success. Direct paths from exposure to smoke-free legislation to quit attempts ($\beta = -0.05$, $p = .495$) and

Table 1. Sample Characteristics in 2008, 2009, 2010, and 2011 (n = 1,012)

	2008	2009	2010	2011
Control variables				
Gender				
Male	48.9	–	–	–
Female	51.1	–	–	–
Age group				
15–24 years	19.5	–	–	–
25–39 years	25.6	–	–	–
40–54 years	30.2	–	–	–
55 years and older	24.7	–	–	–
Educational level				
Low	40.8	–	–	–
Moderate	41.0	–	–	–
High	18.2	–	–	–
Smoking status				
Daily smoker	92.3	–	–	–
Occasional smoker	7.7	–	–	–
Attempts to quit in the last year				
Yes	23.4	–	–	–
No	76.6	–	–	–
Heaviness of smoking[a]	2.4 (1.5)	–	–	–
Individual exposure				
Exposure to smoke-free legislation[b]	–	1.4 (0.6)	–	–
Policy-specific variables				
Support for smoke-free legislation[c]	2.1 (0.8)	2.3 (0.8)	–	–
Awareness of harm of (secondhand) smoking[d]	2.5 (0.9)	2.4 (0.9)	–	–
Psychosocial mediators				
Attitudes about quitting[d]	3.9 (0.7)	–	4.0 (0.8)	–
Subjective norm about quitting[d]	4.2 (0.8)	–	4.2 (0.8)	–
Self-efficacy for quitting[d]	3.2 (0.9)	–	3.4 (1.0)	–
Intention to quit				
Within the next month	4.5	–	2.8	–
Within the next 6 months	17.5	–	15.9	–
Sometime in the future, beyond 6 months	58.2	–	53.5	–
Not planning to quit	19.8	–	27.8	–
Policy-relevant outcomes				
Quit attempt				
Yes	–	–	–	35.2
No	–	–	–	64.8
Quit success				
Yes	–	–	–	19.4
No	–	–	–	80.6

Note. Data are presented as (%) or (M, SD)
[a]On a scale from 0 to 6.
[b]On a scale from 0 to 2.
[c]On a scale from 1 to 4.
[d]On a scale from 1 to 5.

quit success (β = 0.06, p = .447) were nonsignificant, suggesting full mediation.

Discussion

The analyses presented in this paper, involving longitudinal data from four survey waves across 3 years, represent the most extensive test so far of the mediational pathways between policy and behavior that are presented in the ITC Conceptual Model (Fong, Cummings, et al., 2006). We found support for the ITC Conceptual Model, which hypothesized that policies influence smoking cessation through policy-specific variables and psychosocial mediators. The effect of smoke-free legislation on smoking cessation was mediated by one pathway via support for smoke-free legislation, attitudes about quitting, and intention to quit smoking. Smoke-free legislation also influenced the subjective norm about quitting by creating more awareness of the harm of (secondhand) smoking. Our findings are largely in line with earlier studies that have tested parts of the causal chain from exposure to smoke-free legislation on smoking cessation. Consistent with earlier studies, we found that support for

Table 2. Pearson Correlations Between Individual Exposure (2009), Policy-Specific Variables (2009), Psychosocial Mediators (2010), and Policy-Relevant Outcomes (2011)

	1	2	3	4	5	6	7	8	9
1. Exposure to smoke-free legislation (2009)	1.00								
2. Support for smoke-free legislation (2009)	0.11***	1.00							
3. Awareness of harm of (secondhand) smoking (2009)	0.06	0.20***	1.00						
4. Attitudes about quitting (2010)	0.08*	0.27***	0.28***	1.00					
5. Subjective norm about quitting (2010)	0.04	0.16***	0.17***	0.57***	1.00				
6. Self-efficacy for quitting (2010)	0.02	0.20***	0.03	0.27***	0.09**	1.00			
7. Intention to quit (2010)	0.12***	0.18***	0.27***	0.44***	0.22***	0.22***	1.00		
8. Quit attempt (2011)	0.05	0.11**	0.11**	0.23***	0.16***	0.13***	0.36***	1.00	
9. Quit success (2011)	0.01	0.14***	0.03	0.24***	0.17***	0.39***	0.13***	0.31***	1.00

Note. *$p < .05$, ** $p < .01$, *** $p < .001$.

smoke-free legislation and attitudes about quitting were crucial factors in increasing intention to quit smoking (Brown et al., 2009; Macy et al., 2012).

In our model, only attitudes about smoking were significantly associated with intention to quit smoking, whereas subjective norm and self-efficacy for quitting were not after controlling for the other predictors in the model. This is not in line with predictions of social cognitive models (Ajzen, 1991; De Vries & Mudde, 1998), although a meta-analysis (Armitage & Conner, 2001) did find that subjective norms were a weaker predictor of intentions than attitudes and self-efficacy. This meta-analysis also showed that multiple-item measures of subjective norms were a stronger predictor of intentions than single-item measures, which may explain our results. Although this was also found in an earlier study (Bledsoe, 2006), it is unclear why self-efficacy was not significantly associated with intention after controlling for the other predictors in the model. A meta-analysis showed that attitudes, subjective norms, self-efficacy, and intention explain 27% of the variance in behavior (Armitage & Conner, 2001). Our explained variance was similar for quit attempts (28%), but much higher for quit success (50%). This may be caused by the strong direct effect from self-efficacy on quit success, which is consistent with predictions of social cognitive models. Consistent with earlier studies (Borland et al., 2010; Hyland et al., 2006; Zhou et al., 2009), intention to quit was a stronger predictor of quit attempts than of quit success.

Earlier studies that examined the direct effects of smoke-free legislation on smoking behavior found positive effects in some jurisdictions and not in others (Bajoga et al., 2011; Callinan et al., 2010). Earlier ITC studies have also found inconsistent evidence of an effect of smoke-free legislation on smoking cessation (Cooper, Borland, Yong, & Hyland, 2010; Fong, Hyland, et al., 2006; Hyland, Hassan, et al., 2009; Nagelhout, De Vries et al., 2012). The current study sheds some light on psychosocial factors that mediate the effects of smoke-free legislation on smoking cessation, that is, if the legislation is not supported by smokers and smokers do not change their attitudes about quitting, no effects on cessation are to be expected. However, behavioral factors like implementing voluntary smoking bans in homes and cars and complying with smoke-free legislation might also explain why smoke-free legislation stimulates smoking cessation in some individuals and not in others. Moreover, implementation characteristics of the smoke-free legislation may influence whether smoke-free legislation increases smoking cessation. It is, for example, reported that support for smoke-free legislation increases more after the implementation of

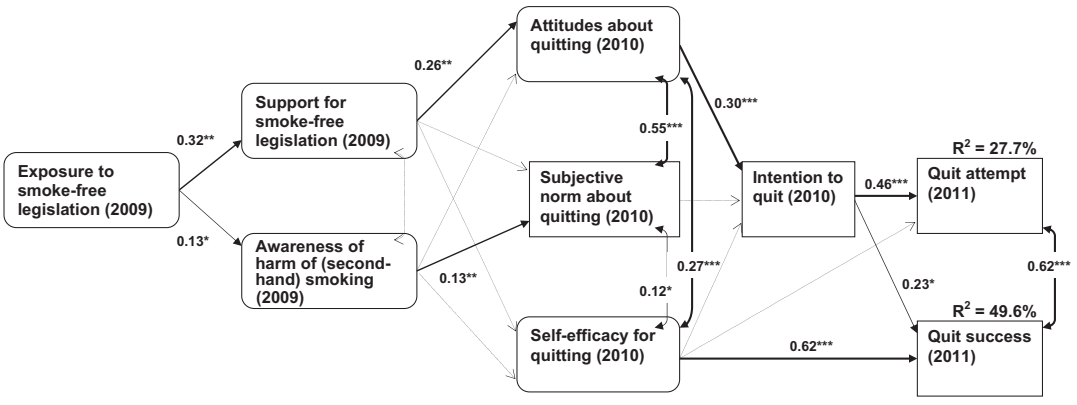

Figure 2. Structural Equation Model with standardized regression coefficients assessing the pathways of change between exposure to smoke-free legislation and quit attempts and quit success. * $p < .05$, ** $p < .01$, *** $p < .001$. To simplify the presentation, control variables, factor loadings, residual values and regression coefficients of non-signinificant paths (dotted lines) were omitted from the figure.

comprehensive than after the implementation of partial smoke-free legislation (Mons et al., 2012; Thrasher, Swayampakala, et al., 2010). Comprehensive smoke-free legislation may therefore lead to more smoking cessation than partial legislation. Also, smoke-free legislation that is implemented with accompanying media attention may lead to more support and harm awareness (Thrasher et al., 2011; Villalobos et al., 2010). The Dutch smoke-free hospitality industry legislation was not comprehensive and was accompanied by unsupportive media attention and an implementation campaign that did not emphasize the harm of (secondhand) smoking (Nagelhout, Van den Putte, et al., 2012). More research is needed on the relations between psychosocial factors, behavioral factors, and implementation characteristics, and how they account for smoke-free legislation effects on smoking cessation.

This study has some important strengths. It is the first study to examine the full causal chain explaining the effect of individual exposure to smoke-free legislation on smoking cessation. The longitudinal nature of the study with four survey waves and a relatively large sample of smokers allows for more confident inferences about the causality of the tested pathways of change. However, there are several limitations that deserve to be acknowledged. First, we were only able to retain half of the baseline respondents over four survey waves, which could introduce selection bias into the inferences from this study. Respondents lost to follow-up were more likely to be younger, female, higher educated, less heavy smokers, and had slightly more self-efficacy for quitting. Therefore, our results may not be fully generalizable to the broader population of Dutch smokers. Furthermore, because we used self-reported measures we could not objectively determine exposure to smoke-free legislation and smoking cessation. People may have been exposed to smoke-free legislation without remembering this at the time of the survey. Also, exposure may take place without actually visiting the hospitality industry, for example, by media attention. The main aim of our modeling strategy, using four waves, was to infer causality of the hypothesized relationships in the ITC Conceptual Model. This has the drawback of being unable to account for short-term effects of smoke-free legislation on smoking cessation. Because modeled effects on policy-specific variables, psychosocial mediators, and smoking cessation are spread over the course of several years, the found total effect may be smaller than the actual total effect, which suggests that our results are conservative.

Our results may not be fully generalizable to other countries because of the differences in smoke-free legislation. Because the smoke-free legislation in Germany is comparable to the Netherlands (Nagelhout, Mons, et al., 2011), we expect that the results are generalizable to Germany. However, the results may not be generalizable to countries where smoke-free legislation is more comprehensive, which may lead to stronger effects than found in our study. For example, in Ireland and England stronger effects on smoking cessation were found after implementation of a more comprehensive ban (Nagelhout, De Vries, et al., 2012).

Our findings have important implications for smoke-free policy implementation and development of accompanying media campaigns. Our study shows that support for smoke-free legislation and attitudes about quitting are crucial factors in increasing intention to quit smoking after the implementation of smoke-free legislation. This suggests that the countries where smoke-free legislation had a positive effect on smoking cessation are the countries where support for the legislation and attitudes about quitting increased the most. Although more (ecological) research is needed to examine this hypothesis, anecdotal evidence from Ireland (Currie & Clancy, 2010) and Greece (Tamvakas & Amos, 2010) has already pointed out that support for the legislation is an important factor in the success of smoke-free legislation. Therefore, countries should actively aim to increase support for the legislation and attitudes about quitting, for example, through accompanying media campaigns and media advocacy.

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Declaration of Interests

None declared.

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